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**Weir**

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(54) **TAMPER-EVIDENT CLOSURE**  
(71) Applicant: **Obrist Closures Switzerland GmbH**,  
Reinach (CH)  
(72) Inventor: **Allison Weir**, New Cumnock (GB)  
(73) Assignee: **Obrist Closures Switzerland GmbH**,  
Reinach (CH)  
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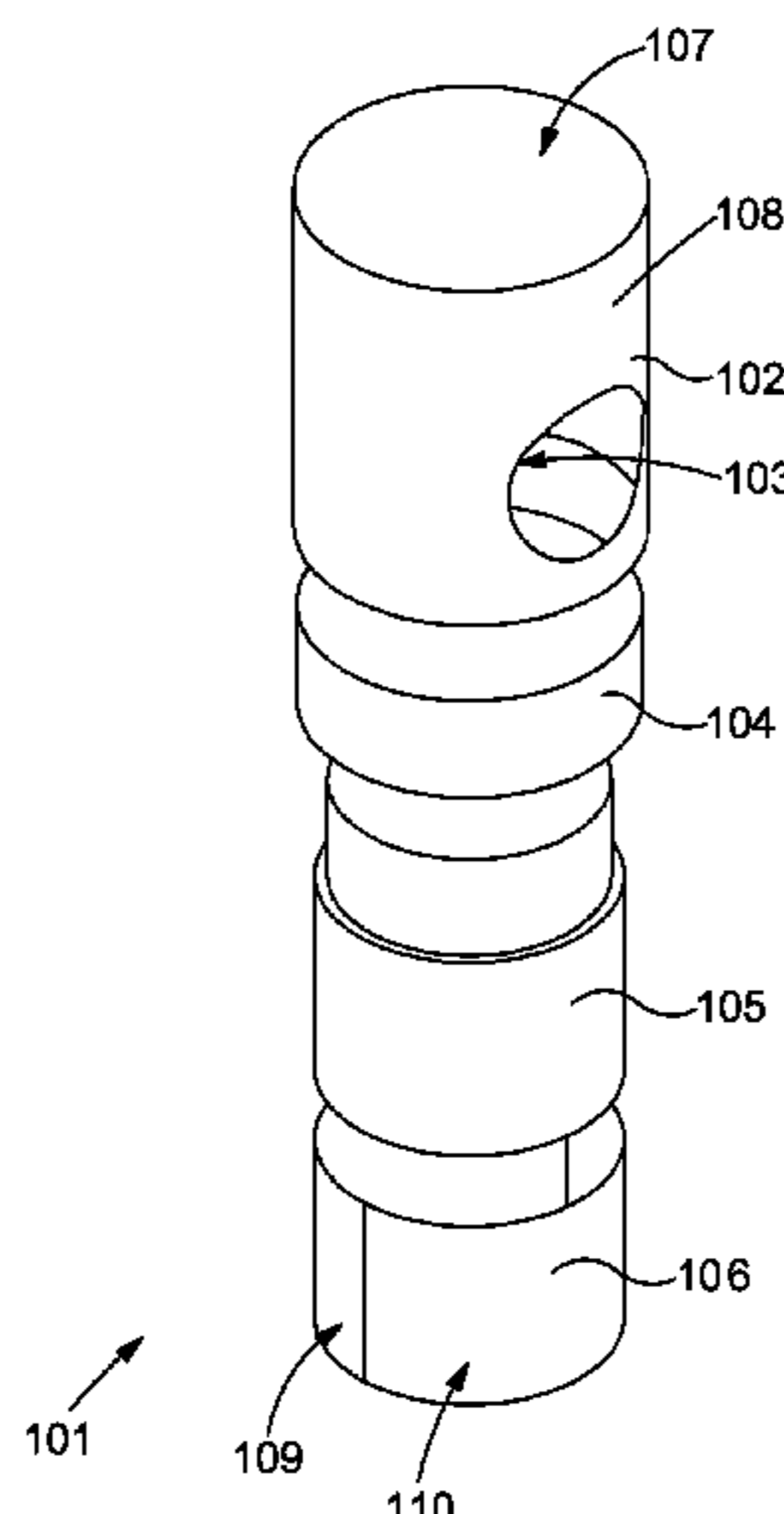
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*Primary Examiner* — Benjamin R Shaw  
(74) *Attorney, Agent, or Firm* — Lightbulb IP, LLC

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(57) **ABSTRACT**  
A tamper-evident closure (101) comprises a first portion (105, 106) and a second portion (102, 104) comprising a window (103) through which a view of the first portion (105, 106) is visible. The second portion (102, 104) is rotated relative to the first portion (105, 106) upon first opening of the tamper-evident closure (101), from a first position in which the first and second portions (105, 106; 102, 104) are in a first relative relation and a first view of the first portion (105, 106) is visible through the window (103), to a second position in which the first and second portions (105, 106; 102, 104) are in a second relative relation and a second, different view of the first portion (105, 106) is visible through the window (103). A locking mechanism irreversibly locks the first and second portions (105, 106; 102, 104) in the second relative relation.

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(52) **U.S. Cl.**  
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**2101/0069** (2013.01); **B65D 2101/0084**  
(2013.01)

**14 Claims, 10 Drawing Sheets**



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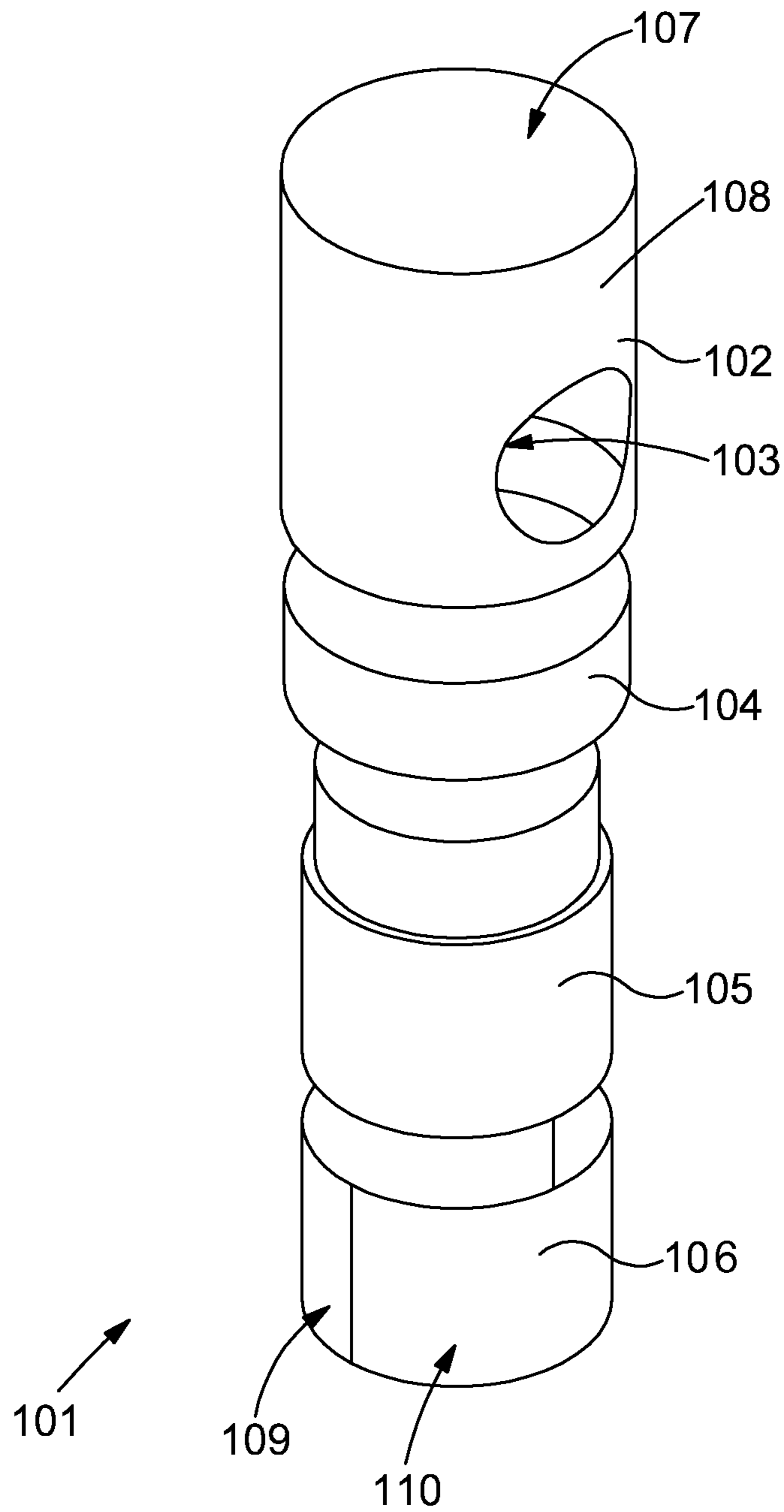


FIGURE 1

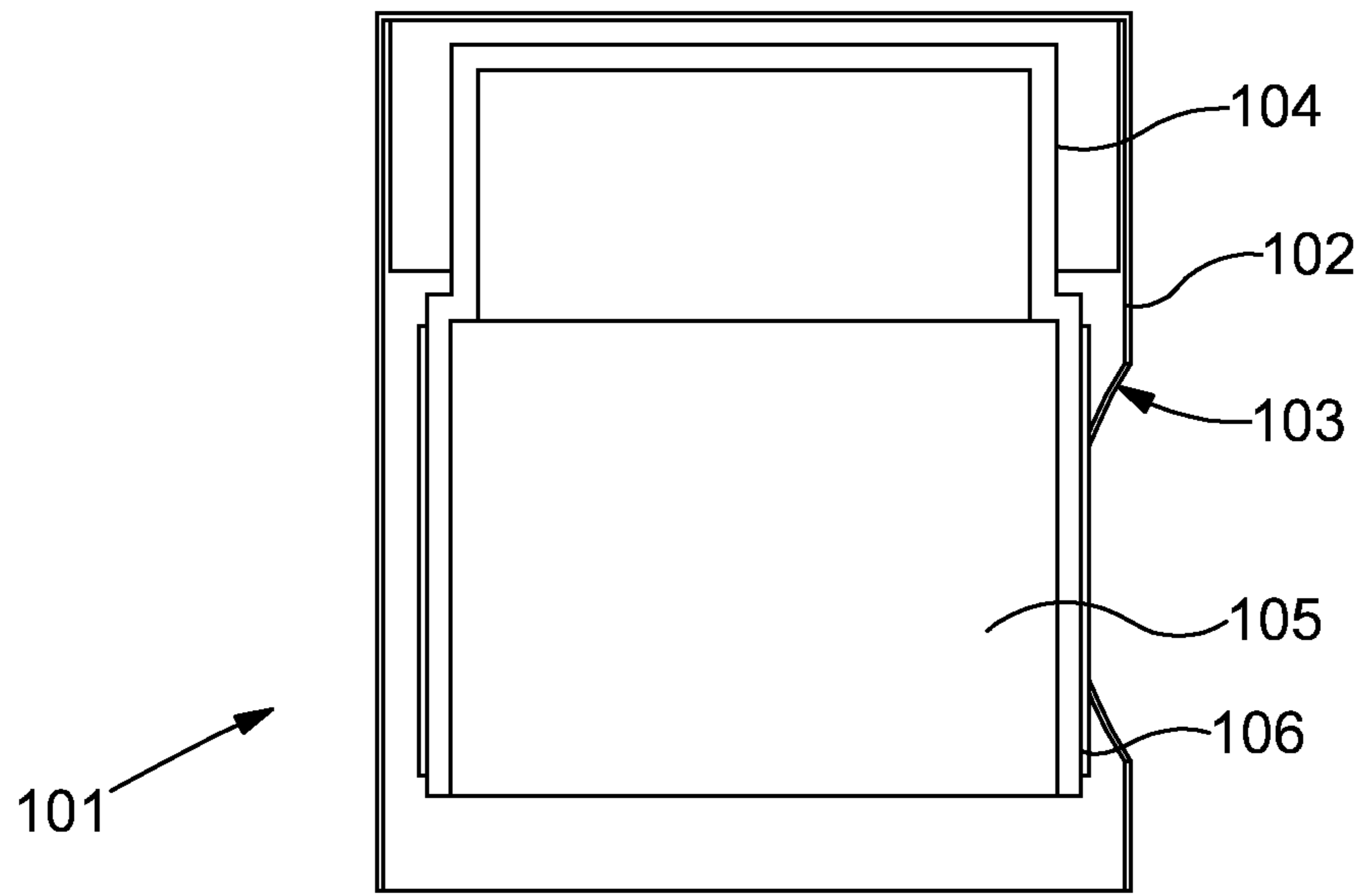


FIGURE 2

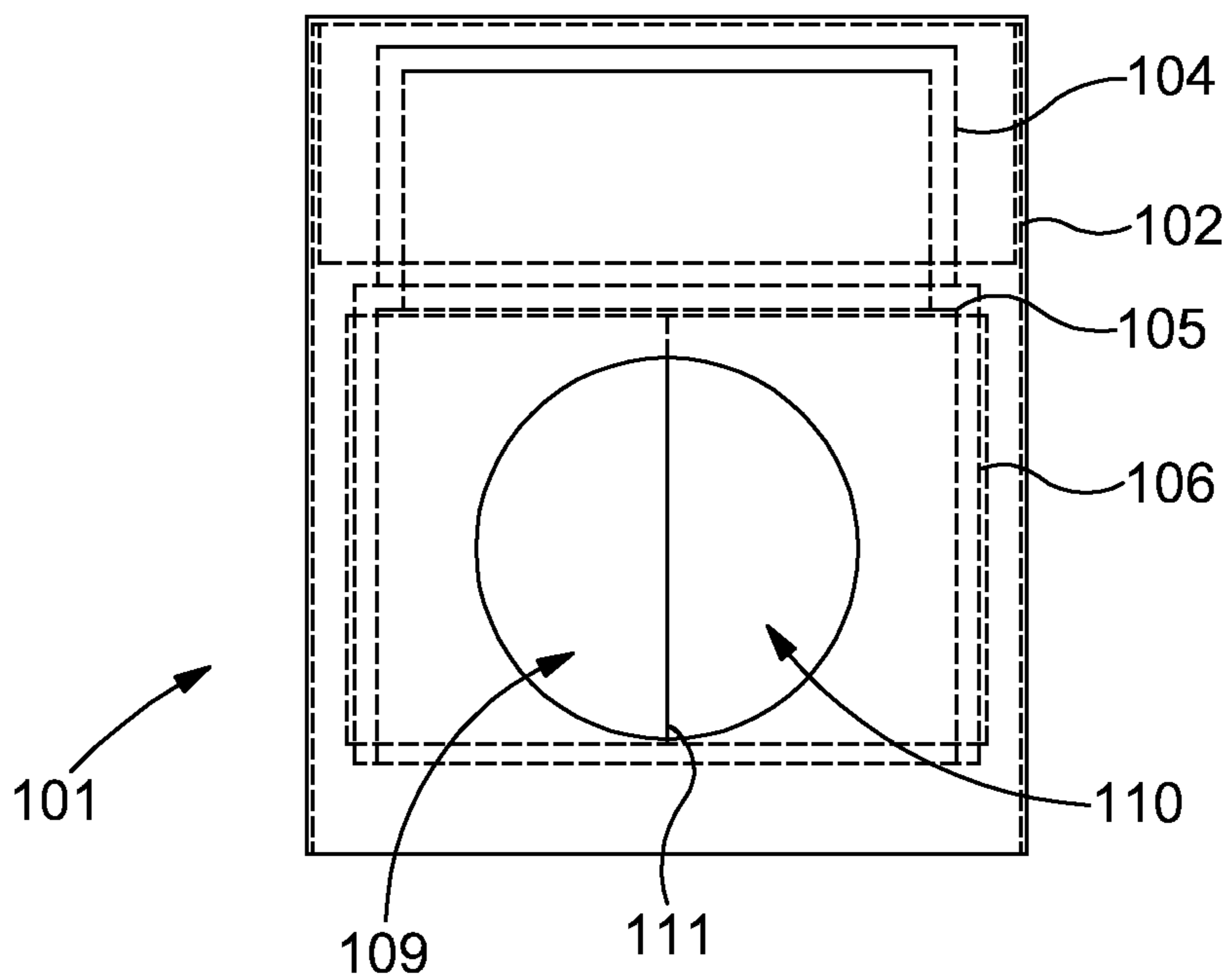


FIGURE 3

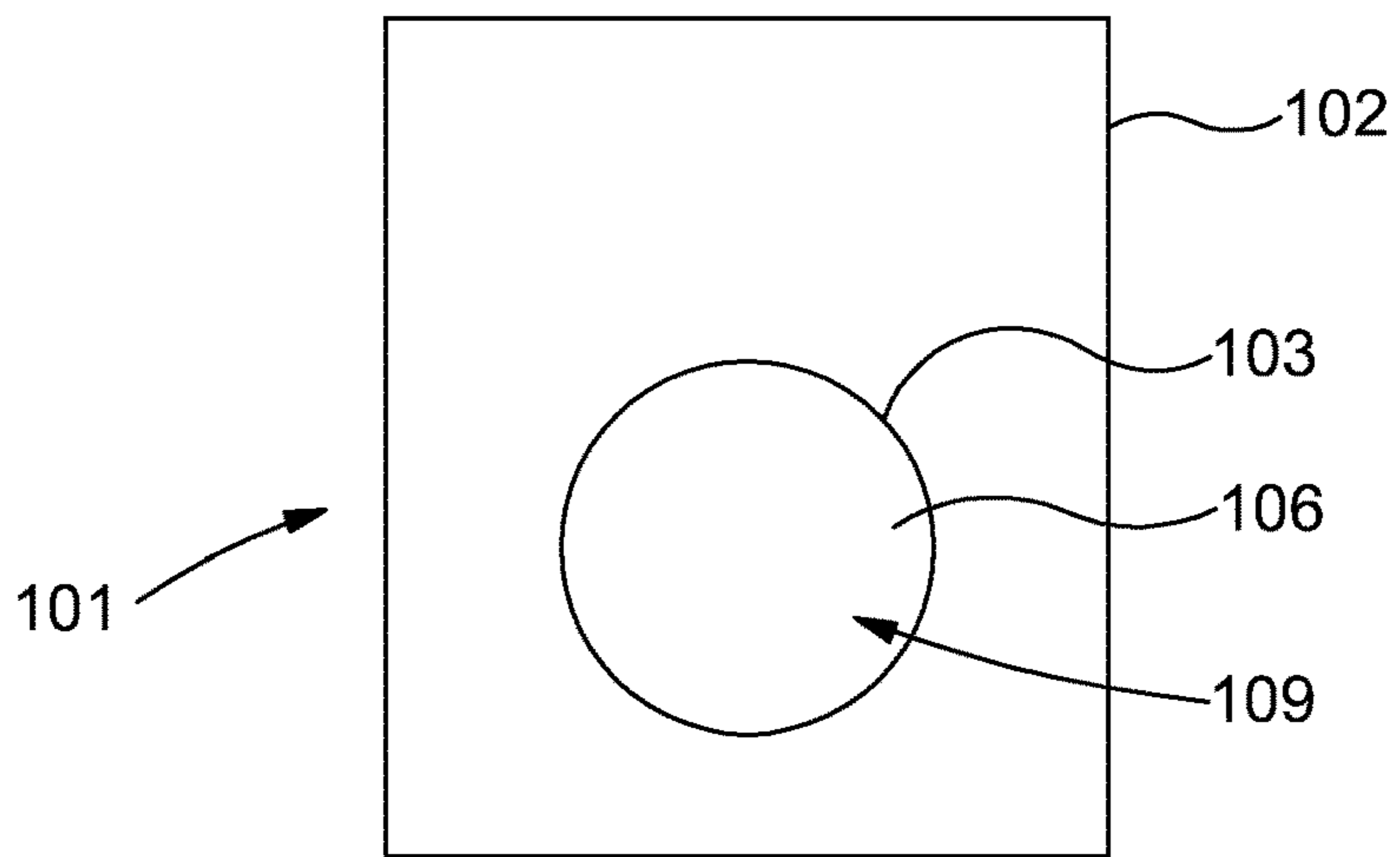


FIGURE 4

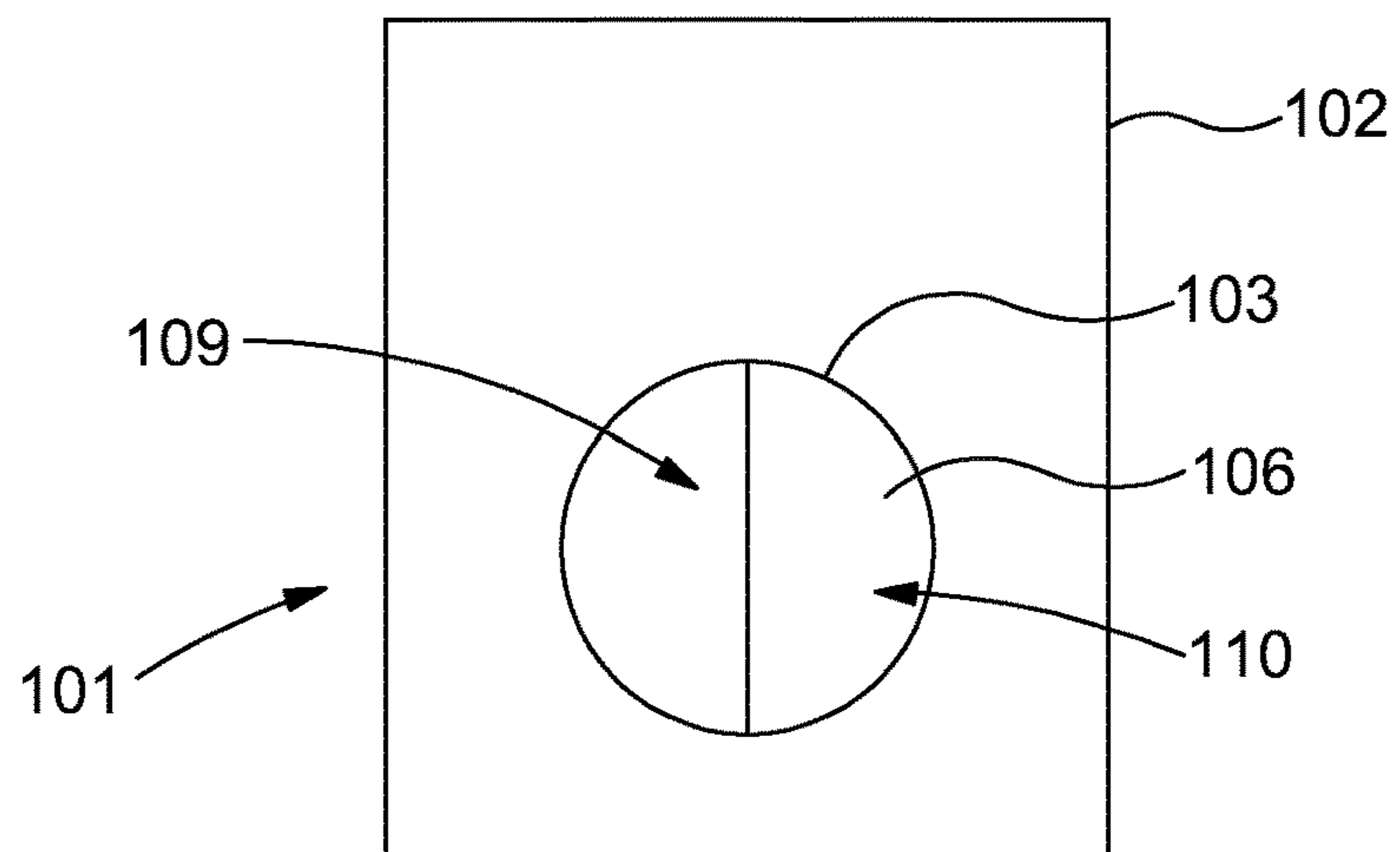


FIGURE 5

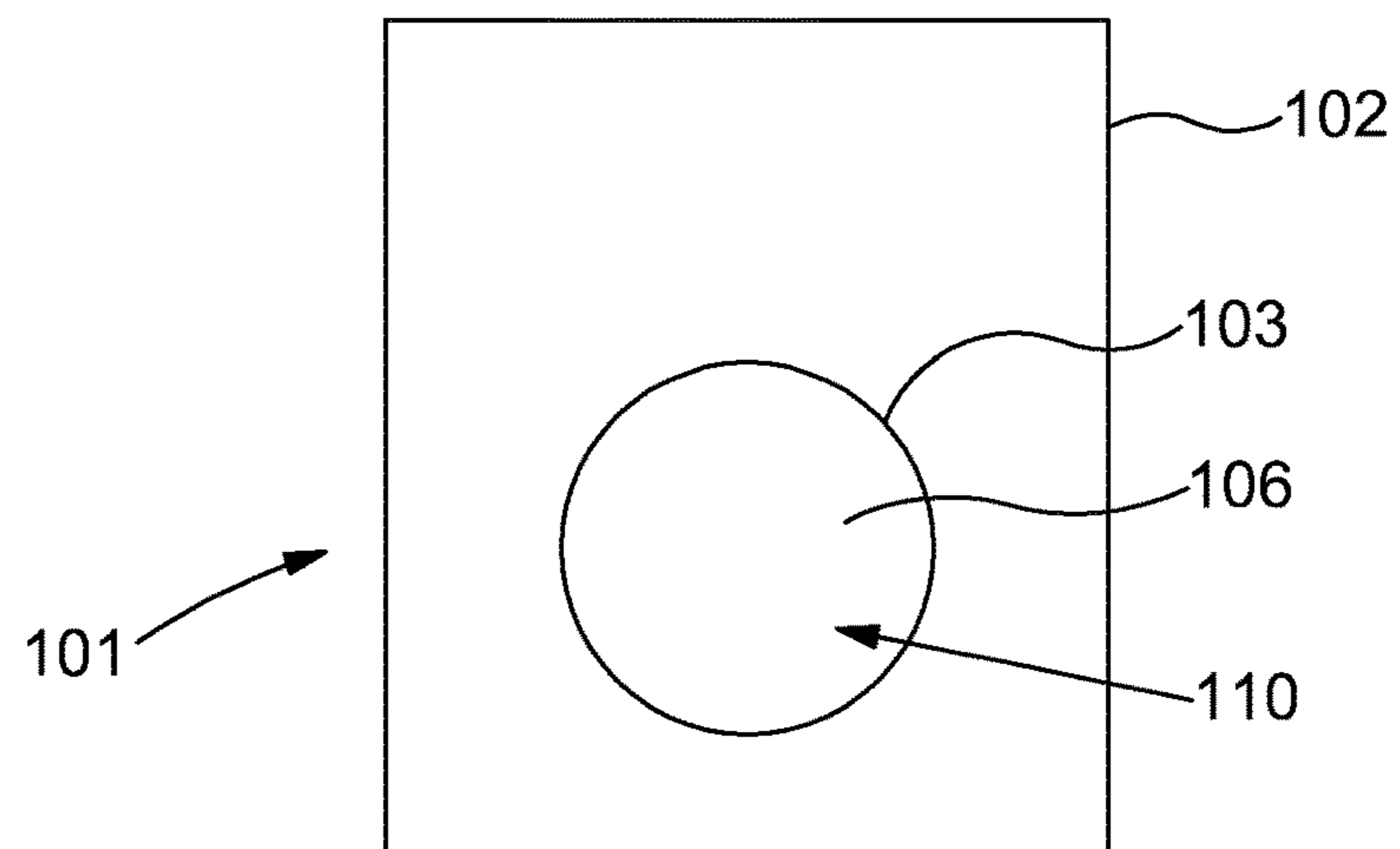


FIGURE 6

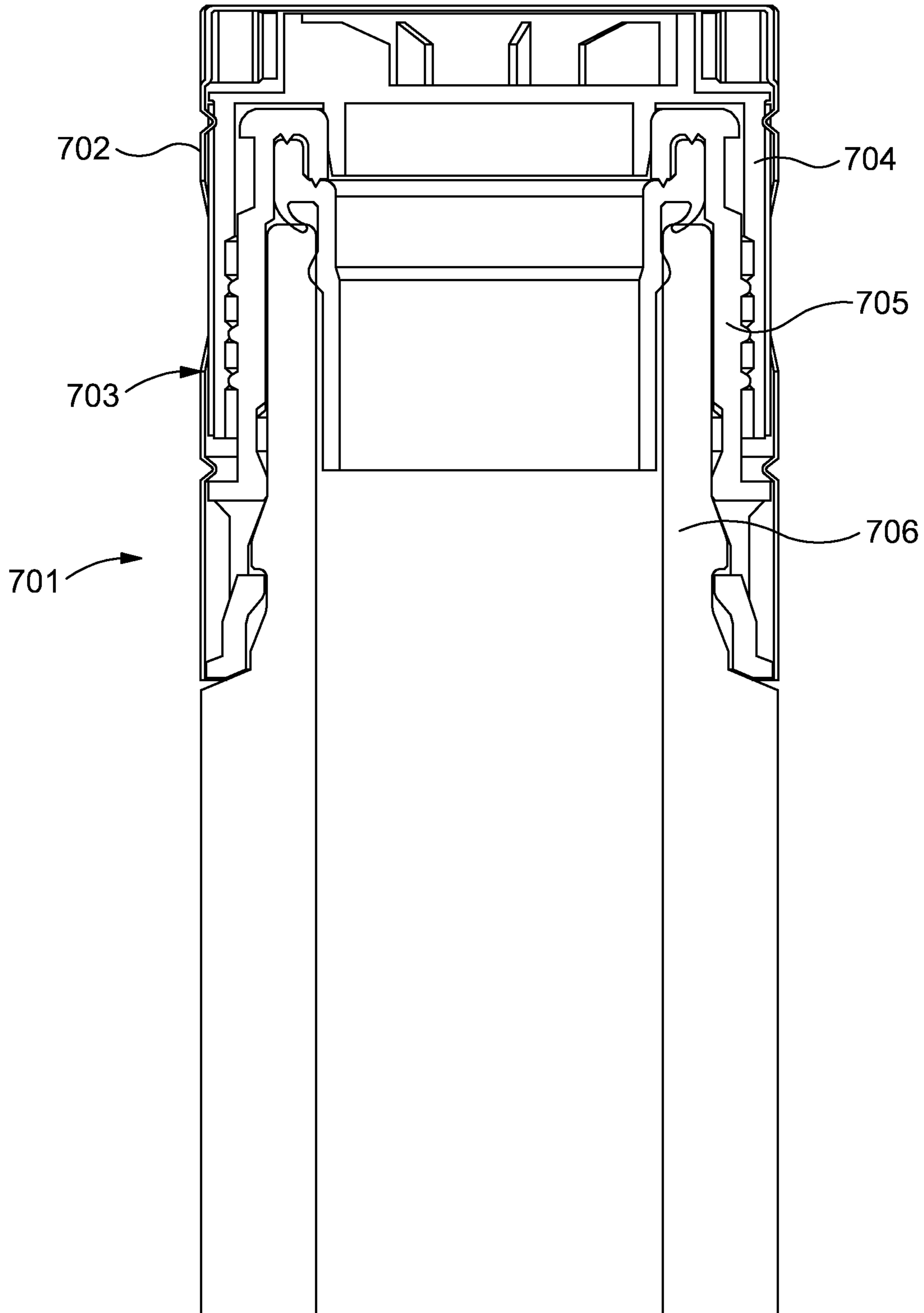


FIGURE 7



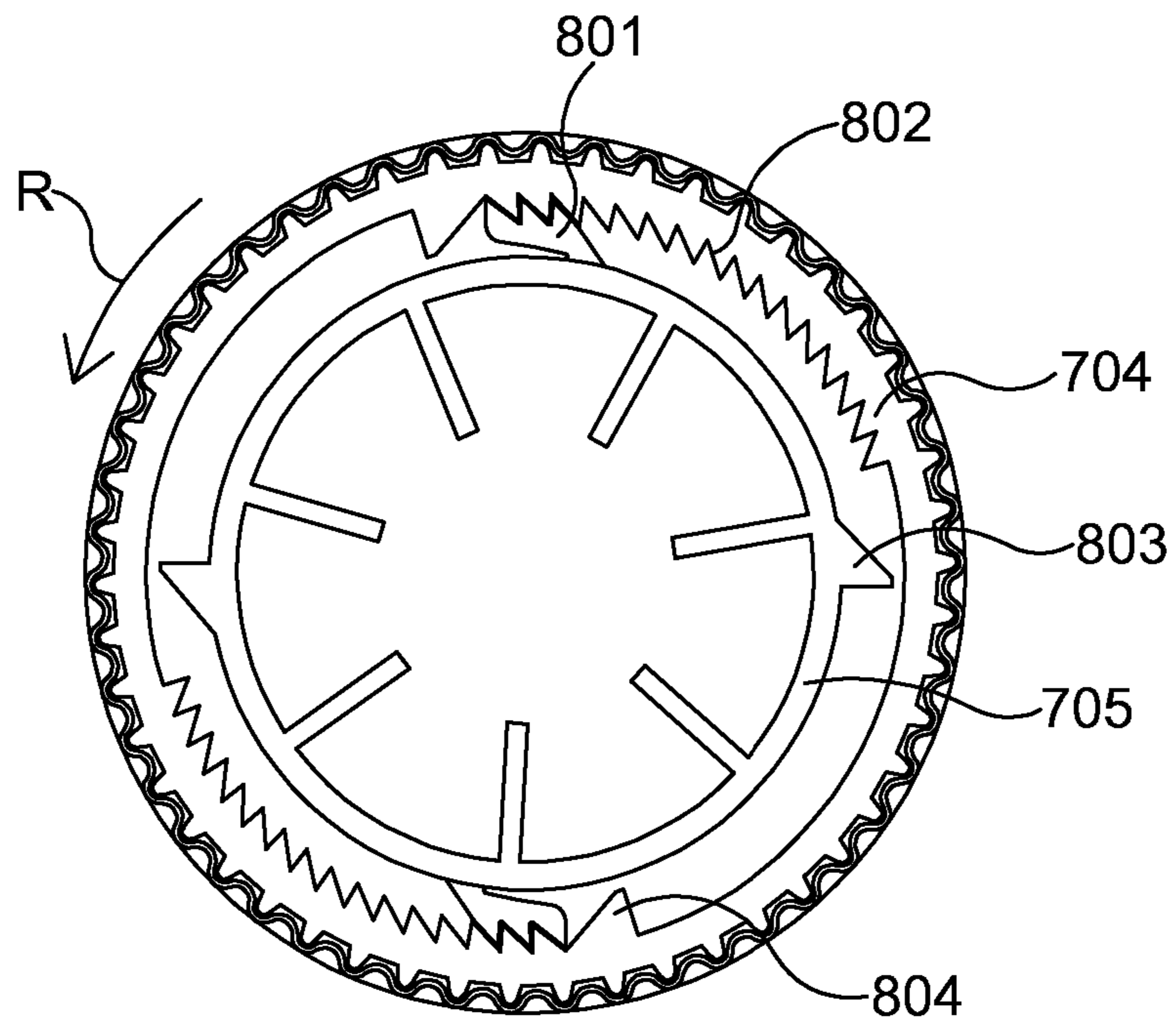


FIGURE 8

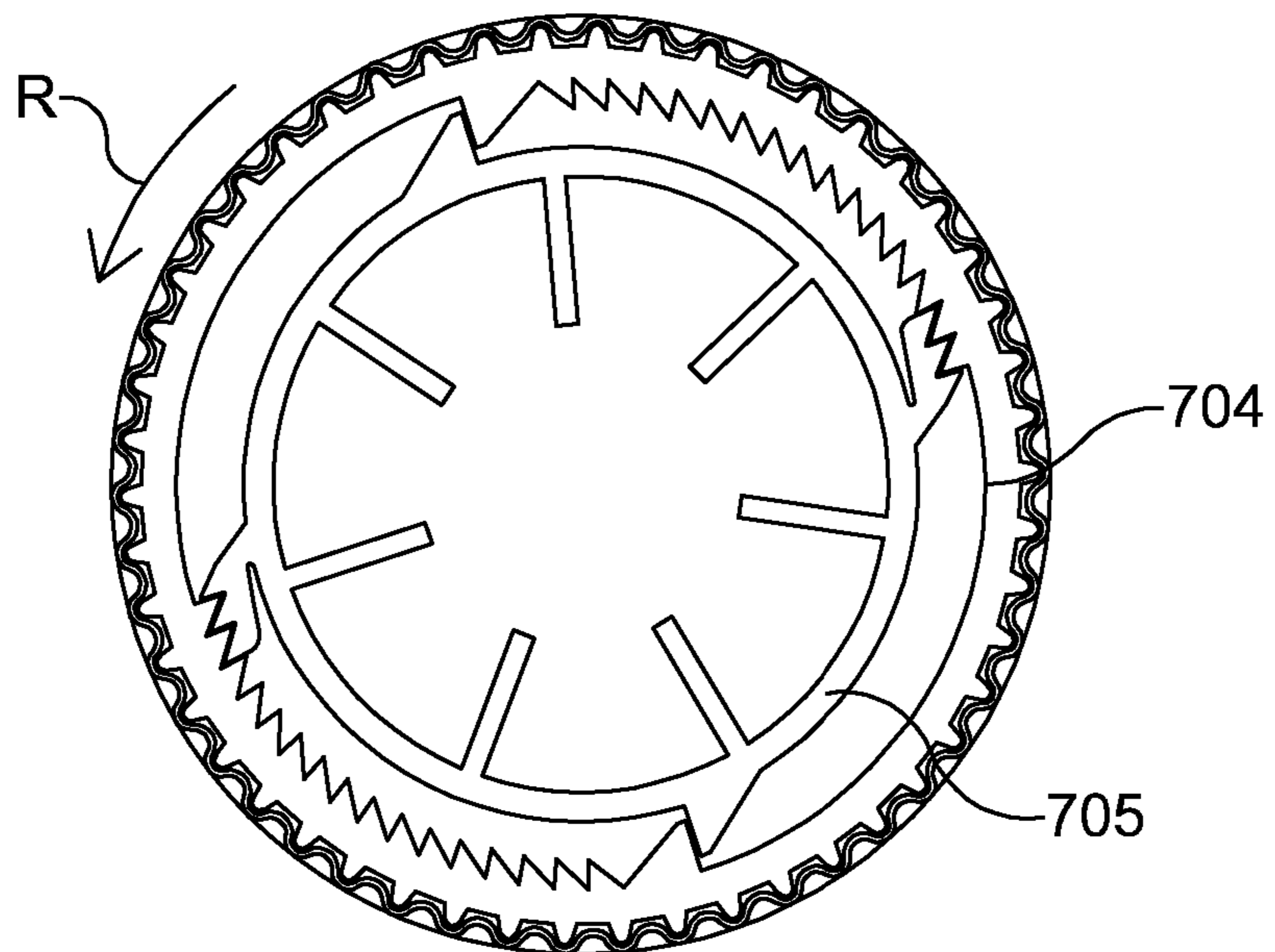


FIGURE 9

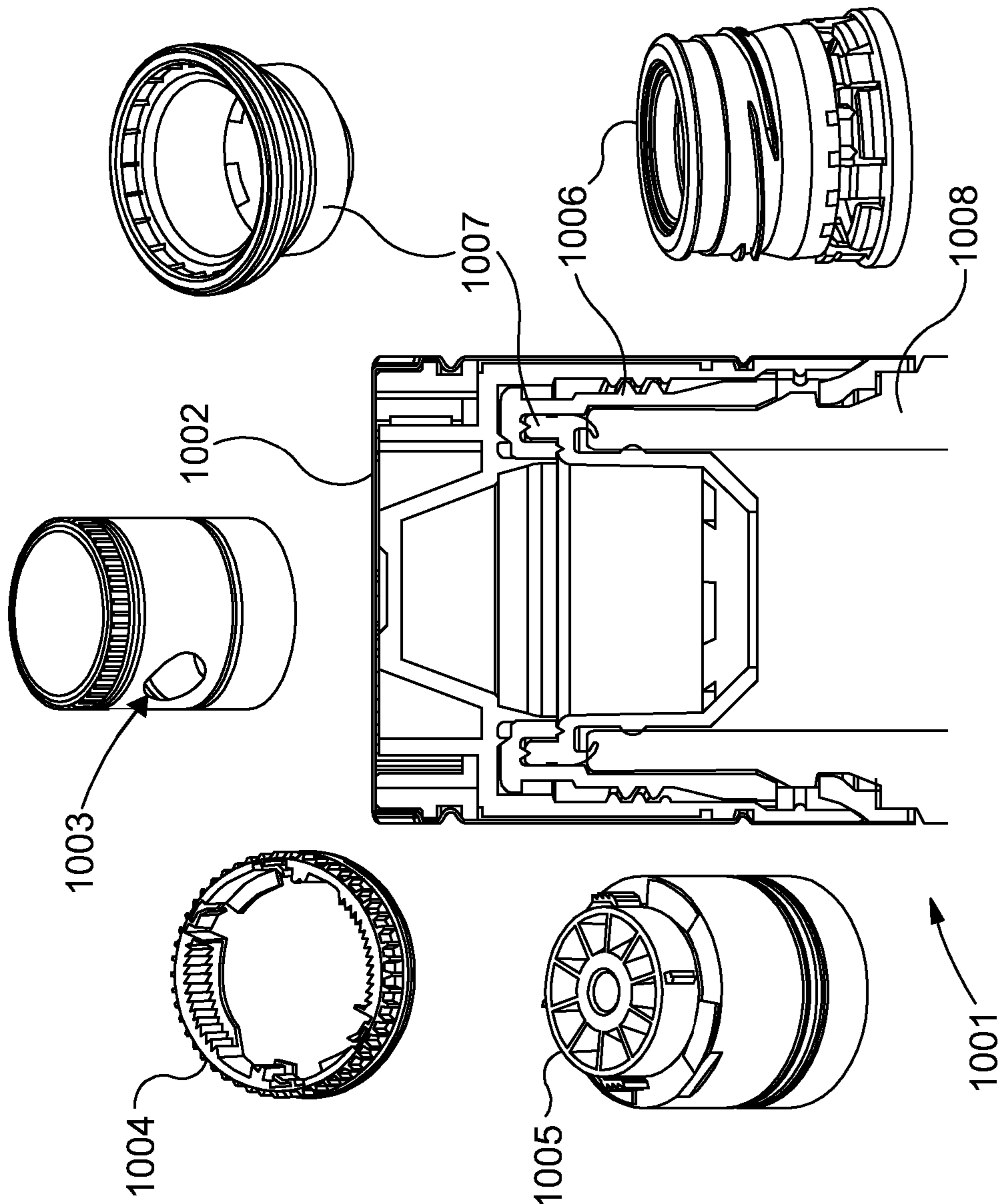
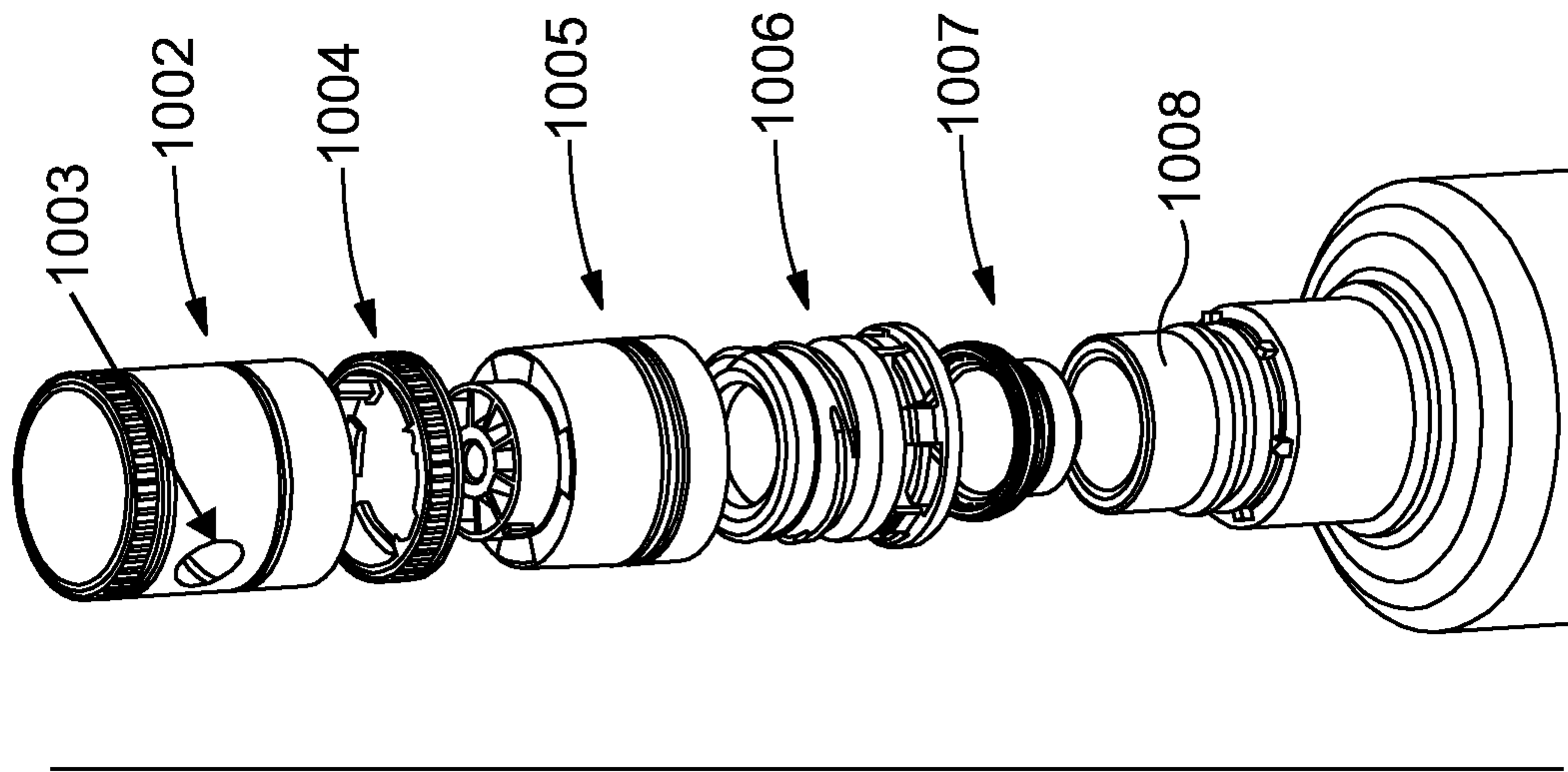


FIGURE 10



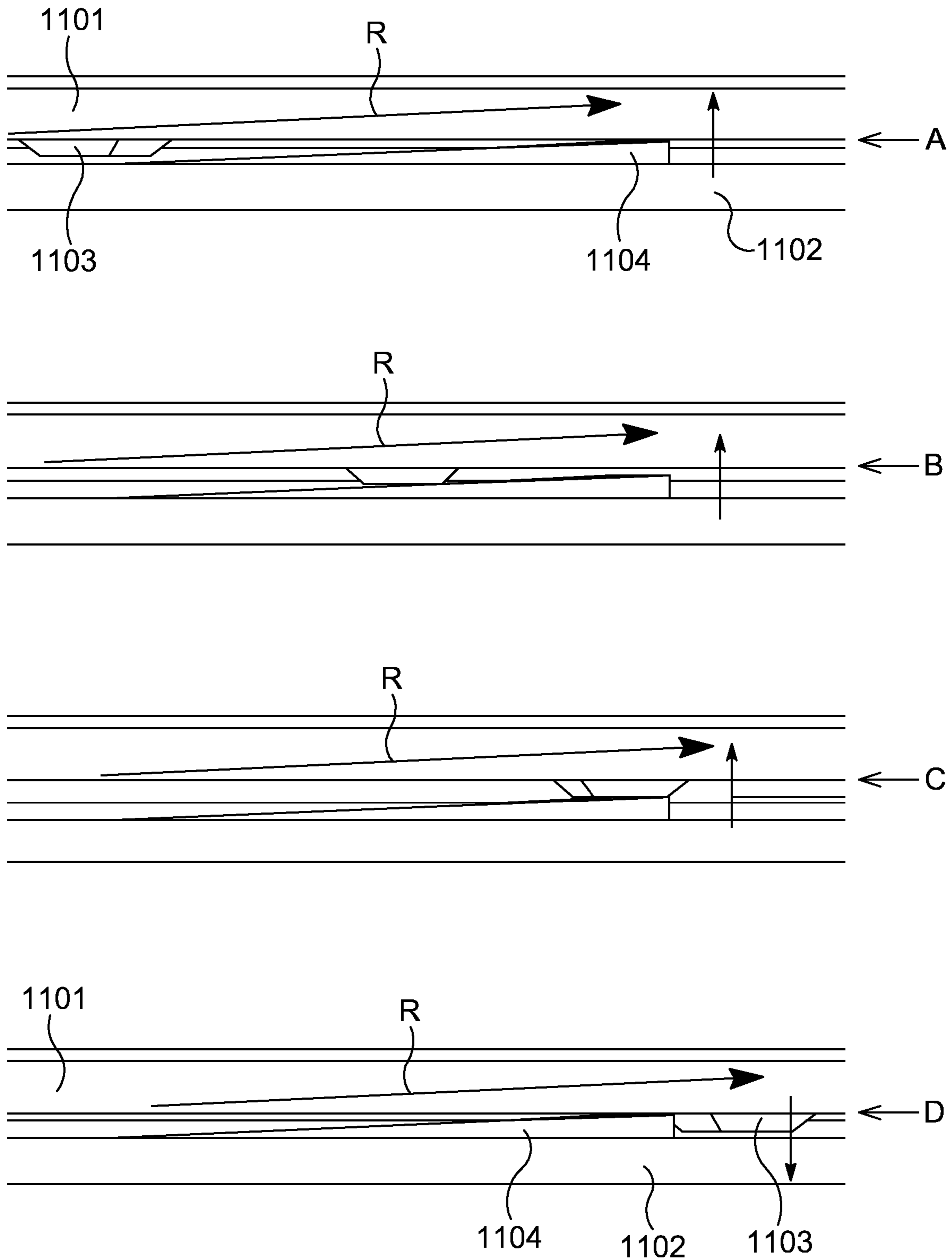


FIGURE 11

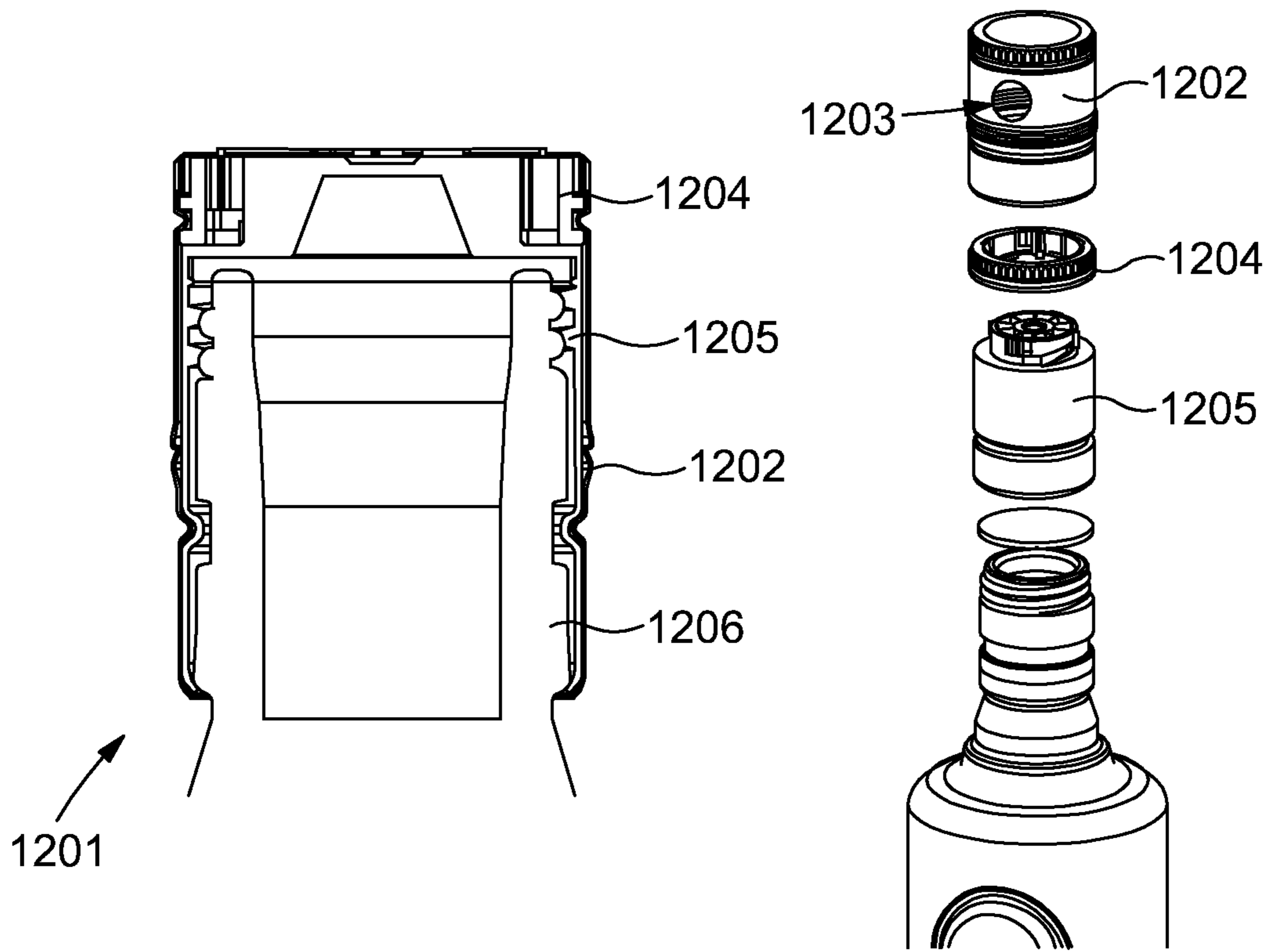


FIGURE 12

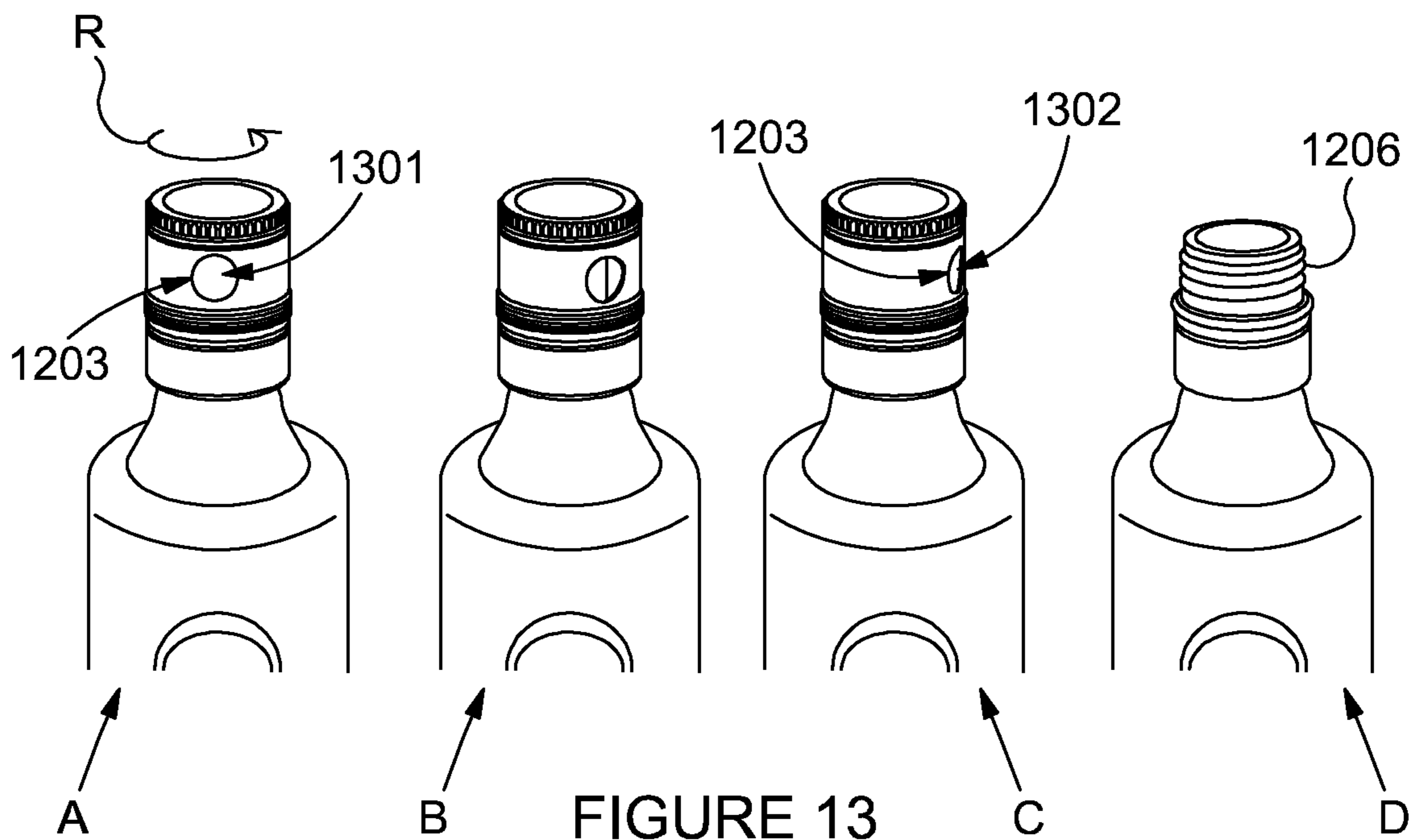


FIGURE 13

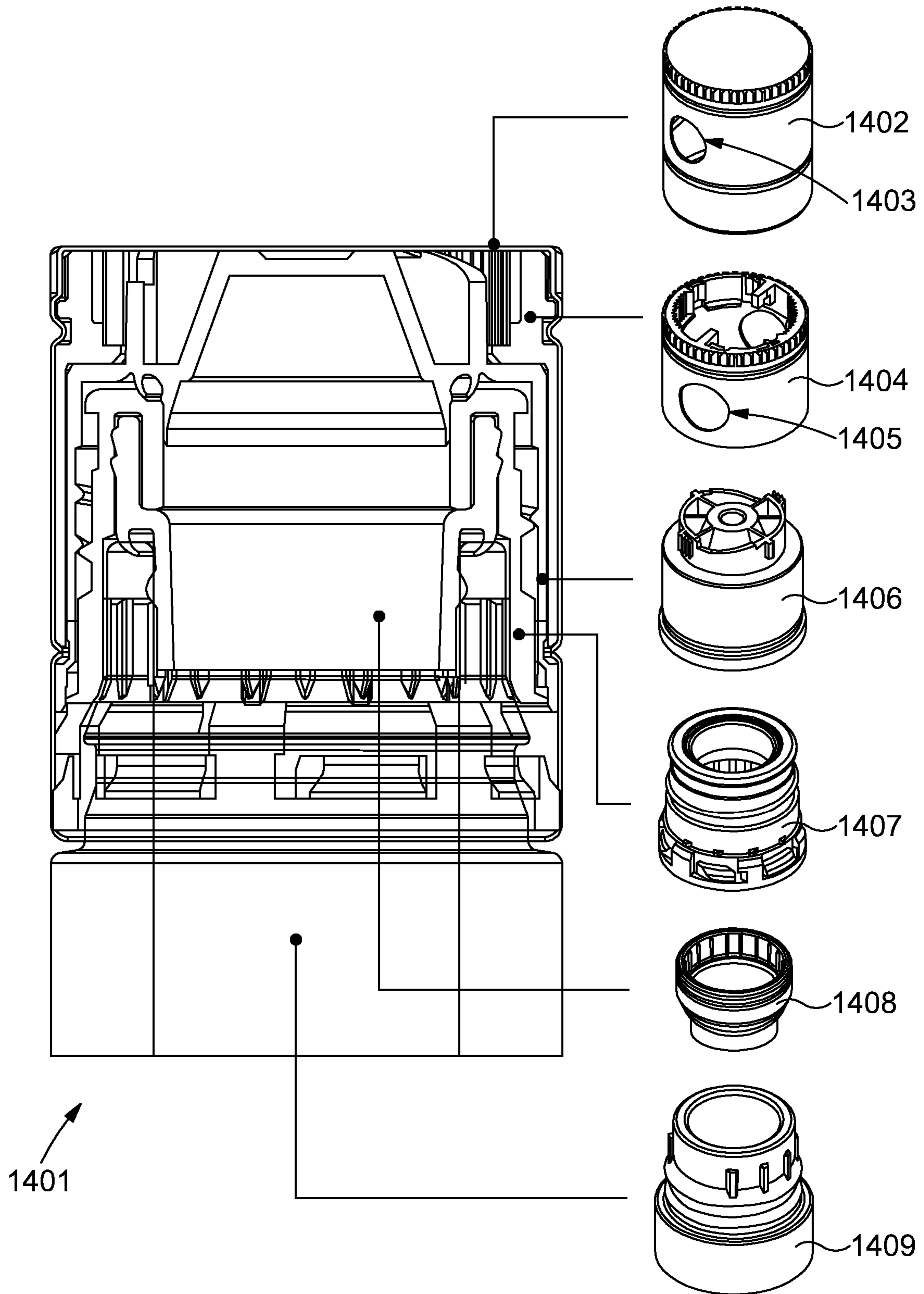


FIGURE 14

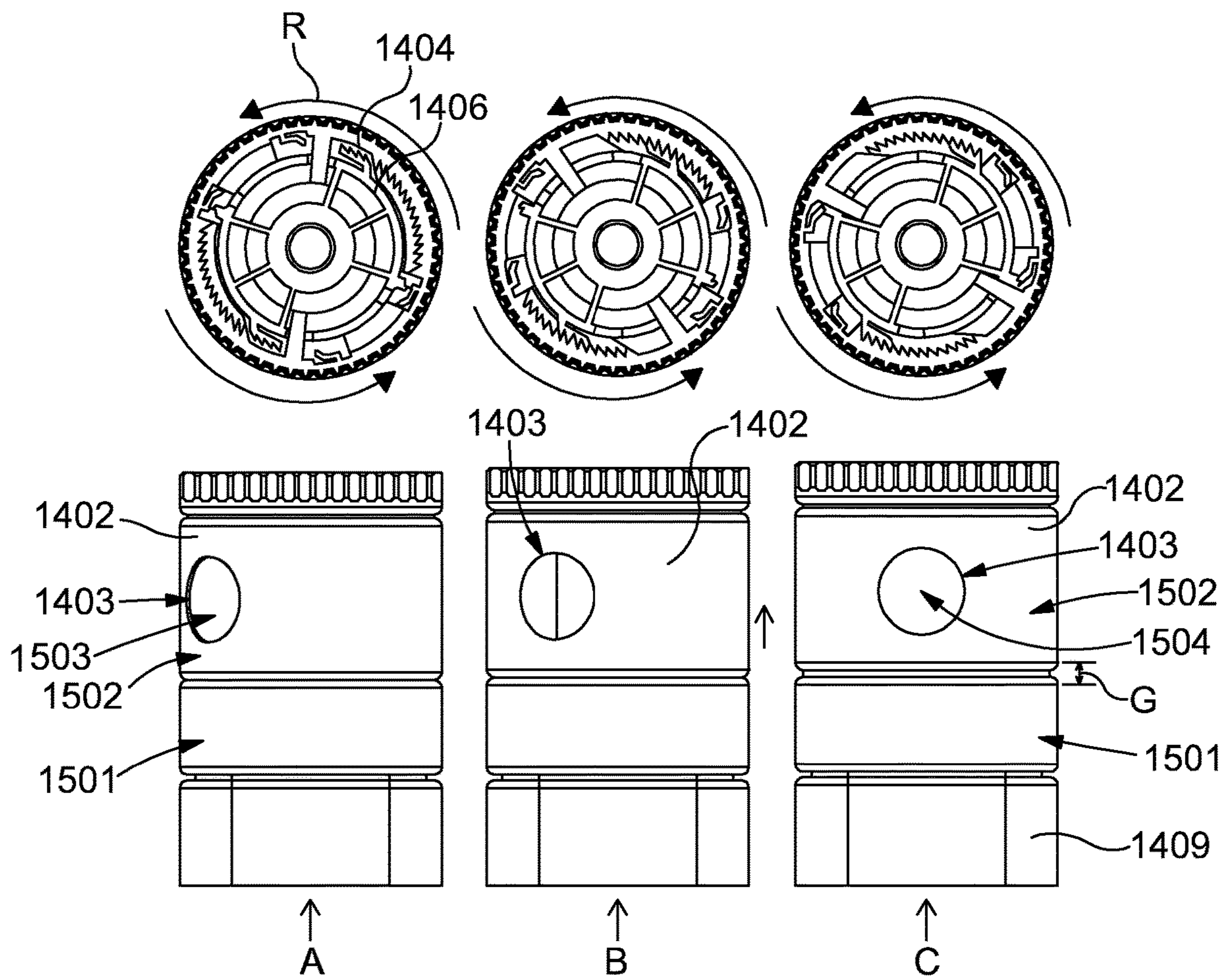


FIGURE 15



**TAMPER-EVIDENT CLOSURE**

## FIELD OF THE INVENTION

The present invention relates generally to a closure for a container neck, and more particularly to a tamper-evident closure with means for indicating that the closure has been opened at least once.

## BACKGROUND OF THE INVENTION

There is an increasing demand for tamper-indicating systems which ensure that a container is not re-filled with non-original contents. Whilst it is relatively easy to produce some form of tamper-evidence, it is much more difficult to provide a closure with tamper-evidence which cannot be either overcome without causing the tamper-evidence system to activate, or activated and then returned to a virtually visually identical state so as to appear non-activated.

A particularly useful method of providing tamper-evidence is to use a system in which a closure is initially located in a first position, but once removed can only be returned to a second position which is visually distinct from the first. Such tamper-evident systems are only effective if they cannot be reversed. For example, in systems which use an obstructing member to hold two parts apart it is possible to cut the obstruction to allow a gap to be closed.

International Patent Publication Nos. WO 2005/049443 and WO 2006/117505 describe closures which generate a gap upon first opening of the closure to indicate that the closure has been opened at least once. The closures generate unobstructed gaps following relative rotation of one part with respect to another. In other words, two parts of the closure are held apart without the requirement of an obstruction. The closures are provided with some internal mechanism for preventing the two parts from being rotated back to their original relative positions.

International Patent Publication No. WO 2014/170284 describes a closure comprising a shell having a distortable portion that is distorted upon first opening of the closure to indicate that the closure has been opened at least once.

It is an object of the present invention to provide further improvements relating to a closure for a container neck.

## SUMMARY OF THE INVENTION

The present invention provides a tamper-evident closure that changes appearance during first opening, the change in appearance indicating that the tamper-evident closure has been opened at least once.

According to a first aspect there is provided a tamper-evident closure for a container neck, the tamper-evident closure comprising: a first portion, and a second portion comprising a window through which a view of the first portion is visible; the second portion rotatable relative to the first portion upon first opening of the tamper-evident closure, in a first direction of rotation, from a first position in which the first and second portions are in a first relative relation to a second position in which the first and second portions are in a second relative relation; and a locking mechanism for irreversibly locking the first and second portions in the second relative relation; rotation of the second portion relative to the first portion causes rotation of the window relative to the first portion, a first view of the first portion is visible through the window when the first and second portions are in the first relative relation, and a second, different view of the first portion is visible through

the window when the first and second portions are in the second relative relation; whereby the view of the first portion through the window of the second portion is irreversibly changed during first opening of the tamper-evident closure.

This change in the view of the first portion that can be seen through the window of the second portion provides an effective tamper-evident feature.

The first view may comprise a first colour presentation and the second, different view may comprise a second, different colour presentation. Any combination of colours may be used. Additionally or alternatively to colour, alphanumeric text, graphics, patterns, pictures, surface finishes and/or textures may be used to provide or contribute to the changing view.

During first opening of the tamper-evident closure, the locking mechanism irreversibly locks the first portion and the second portion in the second relative relation and thereafter the first and second portions may be removable together.

The second portion may comprise a shell in which the window is defined. The shell may comprise a top plate and a side skirt and the window may be defined in the side skirt.

The shell may comprise a metal material. The shell may comprise aluminium.

The window may be an aperture or a cut-out.

The first portion may comprise a sleeve comprising a first zone having a first appearance and a second zone having a second appearance that differs from the first appearance.

The sleeve may comprise a metal material. The sleeve may comprise aluminium. The sleeve may or may not have a continuous perimeter.

The locking mechanism may comprise a ratchet arrangement. The ratchet arrangement may be a lateral ratchet arrangement.

The locking mechanism may comprise an inner ratchet element and an outer ratchet element, the first portion may comprise the inner ratchet element and the second portion may comprise the outer ratchet element.

The tamper-evident closure may comprise a first part, and a second part, when the first and second portions are in the first relative relation, prior to first opening of the tamper-evident closure, the first and second parts may be adjacent one another, and when the first and second portions are moved into the second relative relation, during first opening of the tamper-evident closure, an irreversible gap may be generated between the first and second parts.

The first and second parts may be lower and upper shell parts.

The gap may be unobstructed.

The first portion may be removably engageable with a body portion for fixing to a container neck. The first portion may be removably engageable with a container neck.

The body portion may comprise a pouring fitment. The pouring fitment may comprise a non-return valve.

The window may comprise more than one opening.

The first portion may comprise a second window, rotation of the second portion relative to the first portion may cause rotation of the first window and the second window relative to the first portion, a first view of the first portion may be visible through the second window when the first and second portions are in the first relative relation, and a second, different view of the first portion may be visible through the second window when the first and second portions are in the second relative relation. The first view through the first window and through the second window may be the same or different from each other. The second,



different view through the first window and through the second window may be the same or different from each other.

According to a second aspect there is provided a container neck provided with a tamper-evident closure according to the first aspect.

Different aspects and embodiments of the invention may be used separately or together without departing from the scope of the invention as defined by the appended claims.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be more particularly described, with reference to the accompanying drawings, in which:

FIG. 1 shows an exploded schematic view of components of a tamper-evident closure;

FIG. 2 shows an assembled schematic side view of the components of FIG. 1;

FIG. 3 shows an assembled schematic front view of the components of FIG. 1;

FIG. 4 shows the tamper-evident closure of FIGS. 1 to 3 prior to first opening;

FIG. 5 shows the tamper-evident closure of FIGS. 1 to 3 at a first stage during first opening;

FIG. 6 shows the tamper-evident closure of FIGS. 1 to 3 at a second, subsequent stage during first opening;

FIG. 7 shows features of a locking mechanism;

FIG. 8 illustrates the locking mechanism of FIG. 7 in a first condition;

FIG. 9 illustrates the locking mechanism of FIG. 8 in a first condition;

FIG. 10 shows a further tamper-evident closure;

FIG. 11 shows features of a gap generating mechanism;

FIG. 12 shows features of another tamper-evident closure;

FIG. 13 shows steps in an opening sequence of the tamper-evident closure of FIG. 12;

FIG. 14 shows features of a further tamper-evident closure; and

FIG. 15 shows steps in an opening sequence of the tamper-evident closure of FIG. 14.

#### DESCRIPTION

Example embodiments are described below in sufficient detail to enable those of ordinary skill in the art to embody and implement the apparatus, systems and processes herein described. It is important to understand that embodiments of the invention can be provided in many alternate forms and the invention should not be construed as limited to the examples set forth herein but by the scope of the appended claims.

The present invention provides a tamper-evident closure for a container neck. The tamper-evident closure comprises a first portion, and a second portion comprising a window through which a view of the first portion is visible. The second portion is rotatable relative to the first portion upon first opening of the tamper-evident closure, in a first direction of rotation, from a first position in which the first and second portions are in a first relative relation to a second position in which the first and second portions are in a second relative relation. The tamper-evident closure further comprises a locking mechanism for irreversibly locking the first and second portions in the second relative relation. Rotation of the second portion relative to the first portion causes rotation of the window relative to the first portion. A first view of the first portion is visible through the window

when the first and second portions are in the first relative relation, and a second, different view of the first portion is visible through the window when the first and second portions are in the second relative relation. The view of the first portion through the window of the second portion is irreversibly changed during first opening of the tamper-evident closure. This change in the view of the first portion that can be seen through the window of the second portion provides an effective tamper-evident feature. The change in the view that is visible through the window may be a change in colour.

An exploded schematic view of components of a tamper-evident closure **101** is shown in FIG. 1. In this embodiment, the tamper-evident closure **101** has a substantially circular cross-sectional shape.

Tamper-evident closure **101** comprises a shell **102** in which a window **103** is defined, an outer component **104**, an inner component **105** and a sleeve **106**. In this example, the shell **102** comprises a top plate **107** and a side skirt **108**, and the window **103** is defined in the side skirt **108**.

In the present example, the window **103** is an aperture. In an alternative example, the window is a cut-out. It is therefore to be understood that the window may or may not have a continuous boundary edge that defines a closed shape. In this specific example, the window **103** is a substantially circular aperture; however an aperture or cut-out may have any suitable shape. Furthermore, the window may comprise more than one aperture or cut-out or a combination thereof. The window may comprise a single opening or a plurality of openings, which may be openings in a mesh-like arrangement or in the form of slots or slits.

In this example also, the sleeve **106** comprises a first zone **109** having a first appearance and a second zone **110** having a second appearance that differs from the first appearance of the first zone **109**. In an alternative example, the sleeve **106** comprises more than two zones with different appearances. It is to be appreciated that regions of first and second zones that are immediately adjacent each other or that are spaced apart may be visible through the window before and after first opening of the tamper-evident closure. In this example, the sleeve **106** has a continuous perimeter. In an alternative example, the sleeve does not have a perimeter that forms a closed shape. The sleeve may thus be provided by an annular collar or a strip, which may have a pre-formed profile, or may be formable into a profile, suitable for application to or incorporation within another component.

An assembled schematic side view of the shell **102**, outer component **104**, inner component **105** and sleeve **106** is shown in FIG. 2.

According to the shown arrangement, the outer component **104** is secured within the shell **102**. In an example, the outer component **104** is adhered to the inside of the shell **102**. Any suitable way of fixing the outer component **104** within the shell **102** may be used. In the arrangement shown in this Figure, the outer component **104** is located at the top of the shell **102**.

In addition, according to the shown arrangement, the sleeve **106** is secured to inner component **105**. In an example, the sleeve **106** is adhered to the outside of the inner component **105**. Any suitable way of fixing the sleeve **106** around the inner component **105** may be used. In the arrangement shown in this Figure, the sleeve **106** tightly surrounds the inner component **105**. The sleeve **106** may be located within a recessed region of the external surface of the inner component **105**, and the external surface of the sleeve **106** may then be flush with the external surface of the inner component **105**.



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As can be seen in this Figure, the tamper-evident closure **101** is arranged such that a view of the sleeve **106** is visible through the window **103**.

In the shown arrangement, the outer component **104** is rotatable around the inner component **105**.

In this embodiment, a first portion of the tamper-evident closure **101** comprises inner component **105** and sleeve **106** and a second portion of the tamper-evident closure **101** comprises shell **102** and outer component **104**.

It is to be appreciated that with the shell **102** and outer component **104** in fixed relative relation and with the sleeve **106** and inner component **105** also in fixed relative relation, rotation of the shell **106** causes rotation of the window **103** relative to the sleeve **106**.

Thus, in this embodiment, rotation of the second portion **102, 104** relative to the first portion **105, 106** causes rotation of the window **103** relative to the first portion **105, 106**.

As will be described in further detail below, the second portion **102, 104** is rotatable relative to the first portion **105, 106** upon first opening of the tamper-evident closure **101**, in a first direction of rotation, from a first position in which the first and second portions **105, 106; 102, 104** are in a first relative relation to a second position in which the first and second portions **105, 106; 102, 104** are in a second relative relation, and the tamper-evident closure **101** comprises a locking mechanism for irreversibly locking the first portion and second portions **105, 106; 102, 104** in the second relative relation.

An assembled schematic front view of the shell **102**, outer component **104**, inner component **105** and sleeve **106** is shown in FIG. **3**. It can be seen clearly from this Figure that a view of the first portion **105, 106** of the tamper-evident closure **101** is visible through the window **103** of the second portion **102, 104**. A view of the sleeve **106**, which in this specific illustration comprises both a region of the first zone **109** and a region of the second zone **110**, is visible through the window **103** of sleeve **102**.

The tamper-evident closure **101** is arranged such the view of the first portion that is visible through the window **103** of the second portion irreversibly changes during first opening of the tamper-evident closure **101**.

In the present embodiment, the change in the view that is visible through the window **103** comprises a change of colour.

In this example, the first zone **109** of the sleeve **106** presents a first colour presentation and the second zone **110** of the sleeve **106** presents a second colour presentation that is different from the first colour presentation. In this specific example, the first zone **109** presents a yellow colour and the second zone **110** presents a red colour. Any combination of single colour zones, mixed colour zones or a combination thereof may be used. In this specific example also, there is a distinct transition boundary **111** between the two different colours of the first and second zones **109, 110**. In an alternative example, there is a smooth, blended transition between the colours. The transition from one region, area or zone to another may be sharp or blurred, and different transition types may be used between different regions, areas or zones.

FIG. **4** shows tamper-evident closure **101** prior to first opening. Before the tamper-evident closure **101** has been opened for the first time, the first and second portions of the tamper-evident closure are in a first relative relation and a first view of the first portion is visible through the window **103**. In this illustrated example, when the first and second portions are in the first relative relation, the view of the first portion that is visible through the window **103** of the shell

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**102** comprises only a region of the first zone **109** of the sleeve **106**. In this specific example, the colour yellow is therefore showing in the window **103**.

To open the tamper-evident closure **101**, the shell **102** is rotated in an anti-clockwise direction. This causes the window **103** to be rotated around sleeve **106**.

FIG. **5** shows tamper-evident closure **101** at a first stage during first opening. At the shown first stage, the shell **102** has been rotated from the first position shown in FIG. **4**, in which the first and second portions are in a first relative relation before opening of the tamper-evident closure **101**, towards a second position, in which the first and second portions are in a second relative relation. In FIG. **5**, the shell **102** is shown at an intermediate position, between the first position and the second position.

It can be seen from comparison of FIG. **5** with FIG. **4** that the view of the first portion that is visible through the window **103** has changed, following the change of position of the shell **102**.

In this illustrated example, the view of the first portion that is visible through the window **103** of the shell **102**, following rotation of the shell to the intermediate position shown in FIG. **5**, comprises a region of the first zone **109** of the sleeve **106** and also a region of the second zone **110** of the sleeve **106**. In this specific example, both the colours yellow and red are therefore showing in the window **103**.

FIG. **6** shows tamper-evident closure **101** at a second, subsequent stage during first opening. At the shown second stage, the shell **102** has been rotated from the intermediate position shown in FIG. **4**, into the second position, in which the first and second portions are in a second relative relation.

It can be seen from comparison of FIG. **6** with FIG. **5** that the view of the first portion that is visible through the window **103** has changed again, following the change of position of the shell **102**.

In this illustrated example, the view of the first portion that is visible through the window **103** of the shell **102**, following rotation of the shell **102** to the second position shown in FIG. **6**, comprises only a region of the second zone **109** of the sleeve **106**. In this specific example, the colour red is therefore showing in the window **103**.

Thus, during first opening of the tamper-evident closure **101**, the view through the window **103** changes from a first colour presentation, in this specific example yellow, to a second colour presentation, in this specific example red. It is to be appreciated that any combination of colours may be used and also that additionally or alternatively to colour, alphanumeric text, graphics, patterns, pictures, surface finishes and/or textures may be used to provide or contribute to the changing view. More than one different view may be shown during the opening of the tamper-evident closure. By way of example, the view may change from red, to orange, to green during first opening. By way of further example, the view may comprise stripes that change in spacing and/or thickness and/or colour during first opening.

The use of the window and a view that changes during the initial opening of the closure provides a simple and effective form of tamper-evidence. It is to be appreciated that there may be two or more than two different stages in the change of appearance during the opening event of the tamper-evident closure.

As mentioned previously, the tamper-evident closure **101** comprises a locking mechanism for irreversibly locking the first and second portions in the second relative relation and, in turn, irreversibly locking the corresponding second view of the first portion in the window **103**.



In this embodiment, the first and second portions of the tamper-evident closure **101** together form a cap, the locking mechanism irreversibly locks the first portion and the second portion in the second relative relation and thereafter the first and second portions are removable together.

According to the arrangement of tamper-evident closure **101**:

Before the cap is opened:

The initial first (yellow) colour will be visible (indicating that the cap has not been opened or tampered with)

Once the cap opening sequence begins:

The shell **102** rotates around the sleeve **106** to obscure the initial first (yellow) colour and reveal the subsequent second (red) colour;

The inner and outer components engage to lock the first and second portions of the cap together;

The cap can be removed with the second (red) colour now showing instead of the initial first (yellow) colour (indicating that the cap has been opened);

The cap can be replaced and closed and the second (red) colour will remain showing (indicating that the cap has been opened at least once).

In this illustrated example, shell **102** and sleeve **106** are fabricated from aluminium, and outer component **104** and inner component **105** are fabricated from a plastics material.

It is to be appreciated that each of the first portion and the second portion of the tamper-evident closure may comprise any number of components, each of which may comprise one or more elements. Each part of the tamper-evident closure may be fabricated from any suitable material or combination of materials and may be manufactured using any suitable method, process or technique or combination of any suitable combination thereof. It is to be appreciated that the first portion may comprise or be formed as a single component and/or the second portion comprise or be formed as a single component.

In addition, the tamper-evident closure may be provided with more than one window having a changing view on first opening. A plurality of windows may include windows of the same or different type. A plurality of windows may include windows that have a changing view of the same or different type.

FIG. 7 illustrates features of a locking mechanism usable in a closure provided with the changing view tamper-evidence feature described above.

The locking mechanism is shown as part of a tamper-evident closure **701**. Similar to tamper-evident closure **101**, tamper-evident closure **701** comprises a shell **702** in which a window **703** is defined, an outer component **704** and an inner component **705**. The tamper-evident closure **701** is shown fixed to a container neck **706**.

In this embodiment, a first portion of the tamper-evident closure **701** comprises inner component **705** and a second portion of the tamper-evident closure **701** comprises shell **702** and outer component **704**.

In an embodiment, the first portion is removably engageable with a body portion of the closure for fixing to a container neck. Alternatively, the first portion is removably engageable with the container neck. The first portion may therefore be indirectly or directly fixed to a container neck.

In an example, a body portion of the closure comprises a pouring fitment. In an example, the pouring fitment comprises a non-return valve.

As will be described in further detail, the locking mechanism comprises a ratchet arrangement. In this embodiment, the locking mechanism comprises an inner ratchet element

and an outer ratchet element, the first portion comprises the inner ratchet element and the second portion comprises the outer ratchet element.

In the shown arrangement, the first portion comprises inner component **705** and the second portion comprises shell **702** and outer component **704**. In this specific example, inner component **705** is provided with the inner ratchet element and outer component **704** is provided with the inner ratchet element.

Interengagement between the inner component **705** and the outer component **704** of tamper-evident closure **701** is illustrated in FIGS. 8 and 9.

FIG. 8 illustrates the locking mechanism prior to first opening of the closure. In this Figure, the locking mechanism is shown in a first condition in which the inner and outer components **705**, **704** are in a first relative relation. As shown, the inner component **705** comprises first ratchet teeth **801** and the outer component **704** comprises second ratchet teeth **802**. In addition, the inner component **705** comprises at least one first ratchet stop **803** and the outer component **704** comprises at least one second ratchet stop **804**.

The outer component **704** is shown in a first position in FIG. 8, prior to first opening of the tamper-evident closure **701**. During first opening, the outer component **704** is rotated in the opening direction R. The outer component **704** rotates around the inner component **705**, and the second ratchet teeth **802** of the outer component ratchet along the first ratchet teeth **801** of the inner component **705**. The ratchet engagement between the first and second ratchet teeth **801**, **802** prevents the outer component **704** being rotated in the reverse direction, this being the direction of rotation opposite to the opening direction R.

Rotation of the outer component **704** around the inner component **705** from the first position is allowed until a second position is reached, after which the outer component **704** cannot be rotated further relative to the inner component **705**.

FIG. 9 illustrates the locking mechanism following initial opening of the closure. In this Figure, the locking mechanism is shown in a second condition in which the inner and outer components **705**, **704** are in a second relative relation and the outer component **704** is in a second position.

The outer component **704** is shown having been rotated around the inner component **705** until a second ratchet stop **804** of the outer component **704** has abutted against a first ratchet stop **803** of the inner component **705**. The first and second ratchet stops **803**, **804** provide an end point to the extent that the outer component **704** can rotate around the inner component **705** from the first position to the second position. In the second condition, the inner and outer components **704**, **705** are locked together by the interaction of the first and second ratchet elements of the locking mechanism. The first and second ratchet stops **803**, **804** prevent further rotation of the outer component **704** relative to the inner component **705** in the opening direction R and the first and second ratchet teeth **801**, **802** prevent reverse rotation of the outer component **704** relative to the inner component **705**.

According to the tamper-evident closure **701**, during first opening, the shell **702** and the outer component **704** fixed within are rotated around the inner component **705** until the locking mechanism activates and irreversibly locks the first portion and the second portion together, after which continued rotation causes the first and second portions to be together removable from the container neck **706**.

A further embodiment of a tamper-evident closure **1001** is shown in FIG. 10.



Similar to tamper-evident closure **101**, tamper-evident closure **1001** comprises a first portion and a second portion comprising a window through which a view of the first portion is visible. The tamper-evident closure **1001** comprises a shell **1002** in which a window **1003** is defined, an outer component **1004** and an inner component **1005**. According to this example, the first portion comprises the inner component **1005** and additionally comprises a body **1006** and a bucket **1007**, for fixing to a container neck **1008**. The second portion comprises shell **1002** and outer component **1004**. Unlike the tamper-evident closure **101**, in which the view of the first portion through the window **103** comprises a view of the sleeve **106** that is located around the inner component **105**, according to tamper-evident closure **1001** the view of the first portion through the window **1003** comprises a view of the inner component **1005**. The inner component **1005** may be foiled, sprayed or coated or may otherwise carry a visual presentation that provides the first and second different views that are visible through the window **1003** before and after first opening of the closure.

Features of a gap generating mechanism usable in a closure with a changing view tamper-evident feature as described herein are shown in FIG. **11**.

A first part **1101** is rotatable in an opening direction of rotation **R** relative to a second part **1102**. The first part **1101** comprises a downwardly extending lug **1103** and the second part **1102** comprises an upwardly extending ramp **1104** that is inclined to rise vertically in the direction of rotation **R**. As the first part **1101** is rotated in the direction of rotation **R**, the lug **1103** rides up the ramp **1104** of the second part **1102**, as illustrated at **A** and **B**, causing the first part **1101** to move vertically away from the second part **1102**. As rotation is continued, the lug **1102** reaches the end of the ramp **1104**, as illustrated at **C**, after which it can drop down, as illustrated at **D**, allowing the first part **1101** to descend back towards the second part **1102**. This gap generating mechanism can be used in a closure having a metal shell provided with frangible bridges or a line of weakness, to cause one shell part to be raised relative to another shell part during first opening of the closure to create a separation between those shell parts that assists the breaking of the frangible bridges or line of weakness and then assists the loosening of tension in the shell.

The first part **1101** may be included in the second portion of the closure and the second part **1102** may be included in the first portion of the closure.

FIG. **12** shows features of a further tamper-evident closure **1201**, and steps in the opening sequence of the tamper-evident closure **1201** are shown in FIG. **13**.

As can be seen from FIG. **12**, the tamper-evident closure **1201** comprises a shell **1202** defining a window **1203**, an outer ratchet component **1204** and an inner ratchet component **1205**. The tamper-evident closure **1201** is shown fixed to a container neck **1206**.

Referring to FIG. **13**, at **A**, the tamper-evident closure **1201** is shown prior to first opening. A first view **1301** is visible through window **1203** of shell **1202**. To initiate opening of the tamper-evident closure **1201**, the shell **1202** is rotated in the direction of rotation **R**. At **B**, the tamper-evident closure **1201** is shown after an initial period of rotation of the shell **1202**, and it can be seen that the view through the window **1203** of the shell **1202** has started to change. At **C**, the tamper-evident closure **1201** is shown after a further period of rotation of the shell **1202** has resulted in the inner and outer ratchet components **1204**, **1205** becoming locked together and the view through the window **1203** of the shell **1202** having changed to a second view **1302** that

is visually distinctly different from the first view **1301**. At **D**, the shell **1202**, complete with the locked together inner and outer ratchet components **1204**, **1205** has been removed from the container neck **1206**. The shell **1202**, together with the inner and outer ratchet components **1204**, **1205**, can subsequently be replaced; however the second view **1302** will remain showing in the window **1203**.

In some embodiments an irreversible gap generation mechanism may be included. The irreversible gap generation mechanism may comprise a ratchet arrangement. It is to be appreciated that a tamper-evident closure as described herein may comprise a lateral and/or a longitudinal ratchet arrangement.

In an embodiment, the tamper-evident closure comprises a first part and a second part, when the first and second portions are in the first relative relation, prior to first opening of the tamper-evident closure, the first and second parts are adjacent one another, and when the first and second portions are moved into the second relative relation, during first opening of the tamper-evident closure, an irreversible gap is generated between the first and second parts.

In an example, the first and second parts are lower and upper shell parts.

In a preferred example, the gap is an unobstructed gap. In other words, two parts of the closure are held apart without the requirement an obstruction trapped or otherwise held between them. In an alternative example, the gap is an obstructed gap.

Another embodiment of tamper-evident closure **1401** is shown in FIGS. **14** and **15**. The tamper-evident closure **1401** has both a changing view tamper-evident feature as described above and an irreversible gap generation feature as described above.

The arrangement of tamper-evident closure **1401** includes a shell **1402** comprising a window **1403**, an outer ratchet component **1404** comprising a window **1405** that corresponds to the window **1403** of the shell **1402** and an inner ratchet component **1406**. The arrangement also optionally comprises a body **1407** and a bucket **1408**. This Figure also shows a container neck finish **1409**.

A first portion of the tamper-evident closure **1401** includes the shell **1402** and the outer ratchet component **1404**, which are fixed together, with the respective windows **1403**, **1404** aligned. The second portion of the tamper-evident closure **1401** includes at least the inner ratchet component **1405**.

Stages in the opening of the tamper-evident closure **1401**, during which the view through the window **1403** irreversibly changes and an irreversible gap is generated are shown in FIG. **15**.

As can be seen in FIG. **15**, the shell **1402** of the tamper-evident closure **1401** comprises a lower shell part **1501** and an upper shell part **1502**.

The tamper-evident closure **1401** is shown prior to first opening at **A**. It can be seen that the upper shell part **1502** is initially adjacent the lower shell part **1501**. The upper shell part **1502** and lower shell part **1501** may be joined along a line of weakness. In addition, a first view **1503** is visible through the window **1403** of the shell **1402**.

To initiate opening of the tamper-evident closure **1401**, the shell **1402** is rotated in the opening direction **R**. At **B**, the position of the shell **1402** has changed. In addition, vertical separation of the upper shell part **1502** from the lower shell part **1501** has begun. Further, in this example, the view through the window **1403** has altered.

At **C**, the shell **1402** has been rotated further to a position in which the inner and outer ratchet components **1404**, **1406**



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have locked the first and second portions of the tamper-evident closure **1401** together. In addition, an irreversible gap **G** has been generated between the upper shell part **1502** and the lower shell part **1501**. Further, the view through the window **1403** has irreversibly changed and a second view **1504** that is different from the first view **1503** is through the window **1403** of the shell **1402**.

The shell **1402**, together with the inner and outer ratchet components **1404**, **1406**, can now be removed from the container neck **1409**, through continued rotation of the shell **1402** in the opening direction **R**. The second, different view **1503** remains in the window **1403** to indicate that the tamper-evident closure **1401** has been opened. When the shell **1402**, with the inner and outer ratchet components **1404**, **1406** is replaced, the gap **G** generated during first opening of the tamper-evident closure **1401** is again present between the shell **1402** and the lower shell part **1403**. Thus, the tamper-evident closure **1401** has a first tamper-evident feature, in the form of the window with changing view, that is visible on the removable part and has a second tamper-evident feature, in the form of the gap, that is visible immediately before first removal of the removable part and also when the removable part has been replaced. In an embodiment, more than one irreversible gap is generated. A known gap generator mechanism may be utilised to generate each or the gap.

It is to be understood that a tamper-evident closure is provided by the present invention that comprises at least one tamper-evidence feature that activates during the natural motion of opening. More specifically, as the closure is rotated during opening, the view of the first portion through the window of the second portion irreversibly changes, and at least one irreversible gap may also be generated.

It is to be appreciated that the change of view in the or each window of the tamper-evident closure may be effected as a result of relative rotation of the first portion to the second portion in a single direction of movement (direction of rotation) or two directions of movement (direction of rotation and vertical direction). For example, the first portion may or may not lift or rise relative to the second portion during the phase of the initial opening event in which the view through the window is irreversibly changed.

Although illustrative embodiments of the invention have been disclosed in detail herein, with reference to the accompanying drawings, it is understood that the invention is not limited to the precise embodiments shown and that various changes and modifications can be effected therein by one skilled in the art without departing from the scope of the invention as defined by the appended claims.

The invention claimed is:

**1.** A tamper-evident closure for a container neck, the tamper-evident closure comprising:

a cap, the cap comprising a first portion, a second portion and a locking mechanism; the first portion removably engageable with the container neck or a body portion of the tamper-evident closure for fixing to the container neck, to releasably fix the cap to the container neck, and the second portion comprising a window through which a view of the first portion is visible;

the second portion rotatable relative to the first portion upon first opening of the tamper-evident closure, in a first direction of rotation, from a first position in which the first and second portions are in a first relative relation to a second position in which the first and second portions are in a second relative relation; wherein

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the locking mechanism irreversibly locks the first portion and the second portion in the second relative relation and thereafter the first and second portions are removable together; and wherein

rotation of the second portion relative to the first portion causes rotation of the window relative to the first portion,

a first view of the first portion is visible through the window when the first and second portions are in the first relative relation, and

a second, different view of the first portion is visible through the window when the first and second portions are in the second relative relation;

whereby the view of the first portion through the window of the second portion is irreversibly changed during first opening of the tamper-evident closure;

wherein the tamper-evident closure comprises a first part, and a second part,

when the first and second portions are in the first relative relation, prior to first opening of the tamper-evident closure, the first and second parts are adjacent one another, and

when the first and second portions are moved into the second relative relation, during first opening of the tamper-evident closure, an irreversible gap is generated between the first and second parts.

**2.** A tamper-evident closure as claimed in claim **1**, wherein said first view comprises a first colour presentation and second, different view comprises a second, different colour presentation.

**3.** A tamper-evident closure as claimed in claim **1**, wherein the second portion comprises a shell in which the window is defined.

**4.** A tamper-evident closure as claimed in claim **3**, wherein the shell comprises a top plate and a side skirt and the window is defined in the side skirt.

**5.** A tamper-evident closure as claimed in claim **4**, wherein the window is one of: an aperture, a cut-out.

**6.** A tamper-evident closure as claimed in claim **3**, wherein the shell comprises aluminium.

**7.** A tamper-evident closure as claimed in claim **3**, wherein the first portion comprises a sleeve comprising a first zone having a first appearance and a second zone having a second appearance that differs from the first appearance.

**8.** A tamper-evident closure as claimed in claim **7**, wherein the sleeve comprises aluminium.

**9.** A tamper-evident closure as claimed in claim **1**, wherein the locking mechanism comprises a ratchet arrangement.

**10.** A tamper-evident closure as claimed in claim **9**, wherein the locking mechanism comprises an inner ratchet element and an outer ratchet element, the first portion comprises the inner ratchet element and the second portion comprises the outer ratchet element.

**11.** A tamper-evident closure as claimed in claim **1**, wherein the first and second parts are lower and upper shell parts.

**12.** A tamper-evident closure as claimed in claim **1**, wherein the gap is unobstructed.

**13.** A tamper-evident closure as claimed in claim **1**, wherein the window comprises more than one opening.

**14.** A container comprising a container neck provided with a tamper-evident closure, the tamper-evident closure as claimed in claim **1**.